



LEEDS  
BECKETT  
UNIVERSITY

---

Citation:

Dawson, WD and Booi, L and Pintado-Caipa, M and Okada de Oliveira, M and Kornhuber, A and Spoden, N and Golonka, O and Shallcross, L and Davidziuk, A and Cominetti, MR and Vergara-Manríquez, M and Kochhann, R and Robertson, I and Eyre, HA and Ibáñez, A (2023) The Brain Health Diplomat's Toolkit: supporting brain health diplomacy leaders in Latin America and the Caribbean. *The Lancet Regional Health - Americas*, 28. pp. 1-14. ISSN 2667-193X DOI: <https://doi.org/10.1016/j.lana.2023.100627>

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/10347/>

Document Version:

Article (Published Version)

---

Creative Commons: Attribution-Noncommercial-No Derivative Works 4.0

© 2023 The Authors

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on [openaccess@leedsbeckett.ac.uk](mailto:openaccess@leedsbeckett.ac.uk) and we will investigate on a case-by-case basis.

# The Brain Health Diplomat's Toolkit: supporting brain health diplomacy leaders in Latin America and the Caribbean



Walter D. Dawson,<sup>a,b,c,d,\*</sup> Laura Booij,<sup>a,b,e</sup> Maritza Pintado-Caipa,<sup>a,b,f</sup> Maira Okada de Oliveira,<sup>a,b,g,h</sup> Alex Kornhuber,<sup>a,b</sup> Natasha Spoden,<sup>c</sup> Ona Golonka,<sup>c</sup> Lenny Shallcross,<sup>f</sup> Alejandra Davidziuk,<sup>b</sup> Márcia Regina Cominetti,<sup>g,j</sup> Mayte Vergara-Manríquez,<sup>b,k,l</sup> Renata Kochhann,<sup>m</sup> Ian Robertson,<sup>a,b</sup> Harris A. Eyre,<sup>a,b,n,o,p,q,r</sup> and Agustín Ibáñez<sup>a,b,s,t,\*\*</sup>

<sup>a</sup>Global Brain Health Institute at University of California, San Francisco (UCSF), GBHI Memory and Aging Center, MC: 1207 1651 4th St, 3rd Floor, San Francisco, CA 94143, USA and Trinity College Dublin, Room 0.60, Lloyd Building, Dublin 2, Ireland

<sup>b</sup>Latin American Brain Health Institute (BrainLat), Universidad Adolfo Ibáñez, Diagonal las Torres 2640, Peñalolén, RM, 7941169, Chile

<sup>c</sup>Layton Aging & Alzheimer's Disease Research Center, Department of Neurology, School of Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, CR131, Portland, OR, 97239, USA

<sup>d</sup>Institute on Aging, Portland State University, 1825 SW Broadway, Portland, OR, 97201, USA

<sup>e</sup>Centre for Dementia Research, School of Health, Leeds Beckett University, City Campus, Leeds, LS1 3HE, United Kingdom

<sup>f</sup>Department of Neurology, Peruvian Institute of Neurosciences, Bartolomé Herrera 161, Lince, 15046, Lima, Peru

<sup>g</sup>Department of Psychiatry, Massachusetts General Hospital, 55 Fruit Street, Boston, MA, 02114, USA

<sup>h</sup>Cognitive Neurology and Behavioral Unit (GNCC), University of São Paulo, Butanta, São Paulo, Brazil

<sup>i</sup>World Dementia Council, World Dementia Council Executive Team, Floor 2, 33 Cavendish Square, London, W1G 0PW, United Kingdom

<sup>j</sup>Federal University of Sao Carlos, Rod. Washington Luís, Km 235, Monjolinho, São Carlos, SP, CEP 13565-905, Brazil

<sup>k</sup>University of Udine, Via Monsignor Pasquale Margreth, 3, 33100, Udine UD, Italy

<sup>l</sup>Center of Social and Cognitive Neuroscience (CSCN), Universidad Adolfo Ibáñez, Diagonal las Torres 2640, Peñalolén, RM, 7941169, Chile

<sup>m</sup>Research Projects Office, Hospital Moinhos de Vento, Ramiro Barcelos 610, Porto Alegre, RS, 90035-000, Brazil

<sup>n</sup>Baker Center for Public Policy, Rice University, 6100 Main St, Houston, TX, 77005, USA

<sup>o</sup>Institute for Mental and Physical Health and Clinical Translation (IMPACT), Deakin University, Health and Education Research Building (HERB) at Barwon Health Deakin University School of Medicine, PO Box 281, Geelong, Victoria, 3220, Australia

<sup>p</sup>Euro-Mediterranean Economists Association, C/ de St. Antoni Maria Claret, 167, 08025, Barcelona, Spain

<sup>q</sup>Meadows Mental Health Policy Institute, 2800 Swiss Ave, Dallas, TX, 75204, USA

<sup>r</sup>Department of Psychiatry, Baylor College of Medicine, 1977 Butler Blvd Suite E4.400, Houston, TX, 77030, USA

<sup>s</sup>Universidad San Andres, Vito Dumas 284, B1644BID, Victoria, Buenos Aires, Argentina

<sup>t</sup>National Scientific and Technical Research Council (CONICET), Godoy Cruz 2290 (C1425FQB), Buenos Aires, Argentina

## Summary

Maintaining and improving brain health, one of the most critical global challenges of this century, necessitates innovative, interdisciplinary, and collaborative strategies to address the growing challenges in Latin America and the Caribbean. This paper introduces Brain Health Diplomacy (BHD) as a pioneering approach to bridge disciplinary and geographic boundaries and mobilize resources to promote equitable brain health outcomes in the region. Our framework provides a toolkit for emerging brain health leaders, equipping them with essential concepts and practical resources to apply in their professional work and collaborations. By providing case studies, we highlight the importance of culturally sensitive, region-specific interventions to address unique needs of vulnerable populations. By encouraging dialogue, ideation, and cross-sector discussions, we aspire to develop new research, policy, and programmatic avenues. The novel BHD approach has the potential to revolutionize brain health across the region and beyond, ultimately contributing to a more equitable global cognitive health landscape.

Copyright © 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Keywords:** Brain health; Diplomacy; Health diplomacy; Dementia; Health policy

\*Corresponding author. Layton Aging and Alzheimer's Disease Center, Oregon Health & Science University, 3181 SW Sam Jackson Park Road, CR131, Portland, OR, 97239, USA.

\*\*Corresponding author. Latin American Brain Health Institute, Universidad Adolfo Ibáñez, Diagonal las Torres 2640, Peñalolén, RM, 7941169, Chile.

E-mail addresses: [dawsonw@ohsu.edu](mailto:dawsonw@ohsu.edu) (W.D. Dawson), [agustin.ibanez@gbhi.org](mailto:agustin.ibanez@gbhi.org) (A. Ibáñez).

## Introduction

Maintaining and improving global brain health is the most underrecognized challenge of this century. The emergence of SARS-COV-2 (COVID-19) in 2020 negatively impacted brain health on a global scale, the effects of which are still being uncovered. From the long-lasting neurological effects of COVID-19 infections to the

The Lancet Regional Health - Americas 2023;28: 100627

Published Online 17 November 2023

<https://doi.org/10.1016/j.lana.2023.100627>

impacts of social isolation and loneliness endured by millions during the pandemic, to worldwide disruptions in research on the treatment and prevention of neurodegenerative disorders will all have enduring effects on brain health.<sup>1-4</sup> What is clear in the aftermath of the COVID-19 pandemic is a need for far greater cooperation and collaboration across national borders to address global health threats. This is highly instructive for achieving the goal of maintaining and improving global brain health in the 21st Century.

The current estimated prevalence of dementia in Latin America and Caribbean countries (LACs) is 8.5% and is projected to reach 19.33% by 2050, which represents an increase of approximately 220%.<sup>5</sup> Such prevalence is higher compared to other regions, including Europe (current prevalence is 6.9% and projected to increase to 7.7% by 2050) and North America (current prevalence is 6.5% and projected to increase to 12.1% by 2050).<sup>6,7</sup> The region faces challenges such as fragile healthcare systems, unstable economic development, deficiencies in formal care, and large economic disparities, which were further exacerbated by the COVID-19 pandemic, disproportionately impacted people living with dementia and their care partners.<sup>8</sup> Unique factors associated with unhealthy aging and dementia in LAC include a disproportionate impact of negative social determinants of health (SDoH)—conditions encompassing socioeconomic status, education, physical environment, employment, and social support—and genetics.<sup>9</sup> The cumulative effect of these factors needs convergent approaches to address the distinct profile of genetic risks, negative SDoH, increased prevalence of cardiometabolic conditions, and the

diverse cultural, political, and lifestyle factors across the region. However, brain health research in LAC is currently understudied, and findings from other populations may not be directly applicable due to the region's unique socioeconomic, cultural, and genetic contexts.<sup>10</sup> Therefore, prioritizing diversity and global approaches is essential in order to be relevant and accessible. This calls for the development of scalable, affordable, and multilateral assessments to better understand brain disorders such as dementia and the adverse health impacts in LAC.

In partnership with the Organisation for Economic Co-operation and Development's (OECD) Brain Health Diplomacy Working Group and other key partners including the Latin American Brain Health Institute (BrainLat), a convening of multidisciplinary experts took place in 2021 with the expressed purpose of identifying opportunities to address the global challenge of brain health.<sup>11,12</sup> This group identified improved global brain performance as a priority need, along with the long-term objective of global health commitments on the brain. To generate global awareness of the need for these commitments and for implementing brain health-focused policies, the BHD Working Group endorsed the concept of a prototype toolkit underpinned by the BHD framework (Fig. 1).

The Brain Health Diplomat's Toolkit ([brainhealthdiplomacy.com](http://brainhealthdiplomacy.com)) is a guide for brain health professionals and other professionals, in particular emerging professionals who are in early stages of their careers, to support collaborations across disciplines, sectors, and national borders by providing case studies of exemplary initiatives, impact evaluation tools,

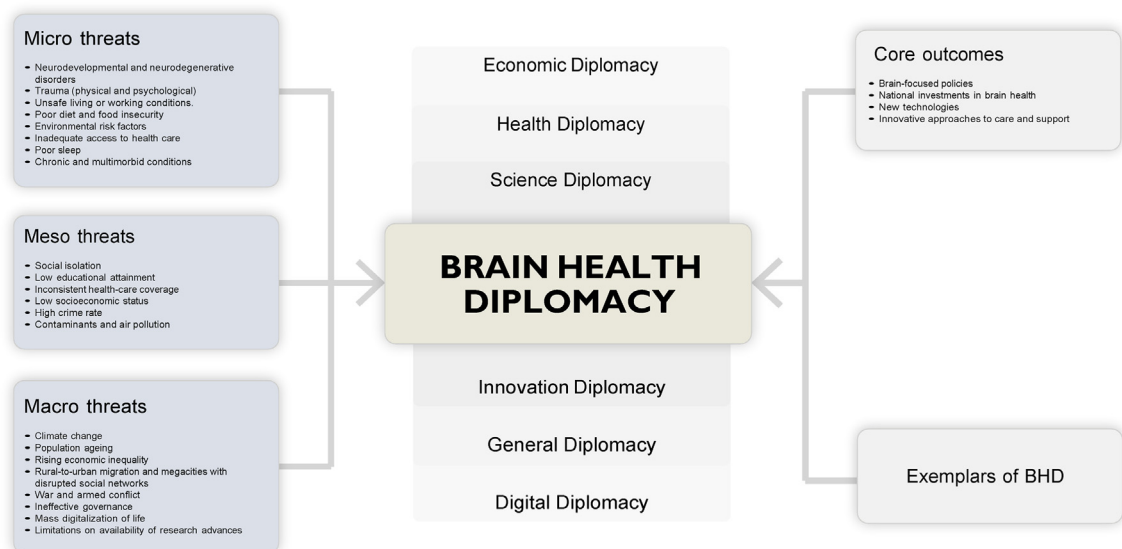


Fig. 1: Brain health diplomacy inputs and outcomes.

resource identification, and a framework for key partner engagement. The Brain Health Diplomat's Toolkit draws on the BHD framework,<sup>11,13,14</sup> which aims to mitigate complex threats to brain health at an individual, community, national, and international level through large-scale diplomacy. This framework specifically seeks to protect global populations from threats to brain health throughout the life course through enhanced collaboration in prevention, treatment, technological innovation, and care interventions along with new public policy. This innovative approach seeks to connect brain health science with the concept of diplomacy, using the Brain Health Diplomat's Toolkit as the catalyst to launch this framework to influence national, regional, and the global brain health agenda.

### Brain health diplomacy in Latin America and the Caribbean

Diplomacy is traditionally defined as the profession, activity, or skill of managing international relations, typically by a country's official representatives or emissaries abroad. However, diplomacy is far broader in application and can be carried out by a wide variety of professionals within their own work and collaborations. This is particularly applicable to health and health policy and specifically brain health. The BHD model builds on several existing theoretical frameworks including health diplomacy, science diplomacy, and innovation diplomacy with the aim of improving global brain health.<sup>15–22</sup>

The Brain Health Diplomat's Toolkit further draws on a proposed action plan put forward by multiple regional initiatives to fight inequities in brain health and dementia care in LAC drawing on the BHD model.<sup>8</sup> The need to apply this framework is salient and increasing in LAC countries as the cumulative burdens of brain health disorders in this region are some of the highest globally.<sup>7,14,23</sup> At the same time, the rich cultural and linguistic diversity of the LAC Region necessitates solutions tailored to the unique needs of populations in specific countries, regions, and local communities. This juxtaposition is admittedly a daunting task which requires great nuance to skillfully thread the global framework with national and community-specific needs.

Alongside this BHD agenda is the development of the Brain Health Diplomat's Toolkit, which provides an introduction to support global brain health advancements for policy practitioners and other professionals. With support from BrainLat, the Toolkit was developed with this focus in mind and the existence of regional strengths related to brain health, research, and advocacy.<sup>8,24</sup> The Toolkit is designed to equip Brain Health Diplomats with a set of tools to help them conceptualize, develop, and implement brain health collaborations.

This first edition of the Brain Health Diplomat's Toolkit is primarily intended for early career professionals with an interest in brain health based in LAC,

although professionals and advocates at all career stages can benefit from the Toolkit's resources. More specifically, it is intended to provide a guide for building partnerships across countries as well as within countries and communities to build brain health capacity across the region. The resources discussed within the Toolkit are also applicable to work that extends globally, which is a longer-term goal of this project. Notably, the Toolkit is a living document. While the best efforts to provide up-to-date information and relevant resources have been made in the development of this resource, the Toolkit will evolve over time to reflect emergent needs.

### 21st century threats to brain health: a model of risk

The threats to brain health can be viewed through a micro (individual), meso (community), and macro (global) level lens.<sup>11</sup> While these threats are often distinct to these levels, they may also cross levels and have multiple impacts.<sup>25</sup> At an individual level, the threats to brain health are well-documented, including a robust body of evidence that supports mitigating these threats.<sup>26–28</sup> These include neurodevelopmental and neurodegenerative disorders, trauma (physical and psychological), unsafe living or working conditions, poor diet and food insecurity, environmental risks, inadequate access to healthcare, poor sleep as well as chronic and often multimorbid conditions, like hypertension and diabetes.<sup>29–38</sup>

The individual threats to brain health highlight the importance of primary prevention of dementia and the need to address the social determinants of health (SDoH) across LAC.<sup>9,27</sup> The World Health Organization's (WHO) Global Action Plan on the Public Health Response to Dementia 2017–2025 outlines several approaches for implementing prevention.<sup>39</sup> Controlling the modifiable risk factors for vascular dementia is of particular importance within LAC given its high prevalence.<sup>40</sup> A public health campaign focused on the detection and reduction of risk factors (e.g., hypertension or diabetes) could produce a high yield for brain health in the region. Similarly, addressing the SDoH at the individual-level must be a focus of policymakers, through a broader conceptualization of the mediators of brain health in LAC and beyond.<sup>41</sup>

The meso-level threats are community level risks to brain health. These risk factors include social isolation, low educational attainment, inconsistent healthcare coverage, low socioeconomic status, high crime rates, contaminants, and air pollution.<sup>30,42–47</sup> This is not an exhaustive list of meso-level brain health threats, but it serves as a robust list that brain health leaders in LAC and globally can focus efforts to advance brain health equity.

At a macro level, global challenges may be the most difficult to address yet require a clear focus of the global

brain health agenda. These threats include climate change, global population ageing, rising economic inequality, ongoing rural-to-urban migration and megacities with disrupted social safety nets, war and armed conflicts, mass migration, ineffective governance, the mass digitalization of life, and limitations on availability of research advances.<sup>6,48-51</sup> Again, this is not an exhaustive list of threats to global brain health. Yet, these are some of the most vexing global threats that necessitate a regional and global response through enhanced collaborations.

## Methods

To inform the Brain Health Diplomat's Toolkit's development (Fig. 2), a selective review through literature searches using key search terms such as 'brain health' and 'diplomacy' in scientific databases (e.g., PubMed) along with a review of grey literature took place. Between June and September 2021, in-depth interviews were conducted with experts and brain health leaders. These experts represented non-governmental organizations (NGOs), academia, industry, and brain health advocates (n = 15). The information gathered from these meetings helped in the planning and approach taken in the work of the OECD BHD Working Group.

A virtual convening of the BHD Working Group took place in November 2021. This meeting reached consensus on a framework for actions to support global brain health, including an initial goal of building a Toolkit for use by brain health leaders to advance brain health equity. Funding to build the Toolkit was then sought and obtained from BrainLat and Global Brain Health Institute (GBHI).

Between July 2022 and April 2023, efforts to design and build the Toolkit took place. An initial draft was completed in February 2023. An electronic survey (via Google Forms) was developed and shared with key partners across LAC between March and April 2023

(n = 250). Feedback was gathered on perceptions of the Toolkit, usability of the resources offered, and recommendations on how to further refine the Toolkit to be valuable to professionals (n = 64). The Toolkit was finalized in June 2023, and shared with regional and global partners in government, academia, and industry in July 2023 as part of dissemination efforts. The BHD team also utilized communication strategies including the use of social media to share the Toolkit with as large an audience as possible. The evolving risks and opportunities for building brain health equity suggest the Toolkit should be updated as necessary to reflect emerging needs in LAC and beyond.

## Existing models of diplomacy

Given the scale of many health and human development related challenges, several international organizations like the World Health Organization (WHO) and United Nations (UN) and NGOs have already established their own frameworks or programs that draw on different fields of diplomacy and focus on developing capacity in specific areas. The following examples (Table 1) are subtypes of diplomacy and organizations who have pursued actions.

## Brain health diplomacy models

There is an increasing global focus and understanding of brain health as a key driver of health and well-being.<sup>12,28</sup> The COVID-19 pandemic brought the role of the brain into sharper focus given multiple impacts on mental health and cognitive function. Many of the multi-national, brain-focused organizations and initiatives pre-dated the pandemic. For example, GBHI was established in 2015 with the clear purpose of reducing the global burden of dementia through training emerging leaders in brain health.<sup>58</sup> In LAC, the

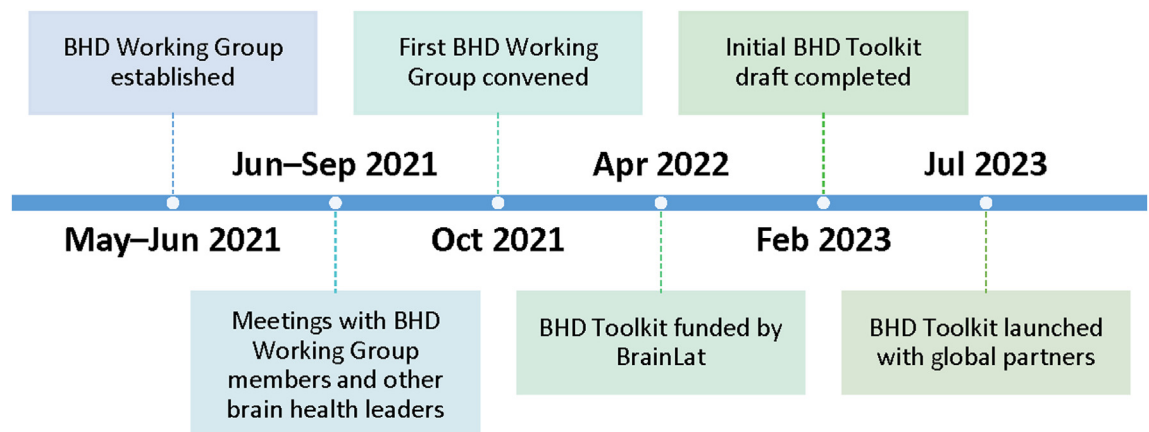


Fig. 2: Timeline of development: The Brain Health Diplomat's Toolkit.

Type	Organization	Definition
Science Diplomacy	American Academy for the Advancement of Science (AAAS)/the European Science Diplomacy Cluster <a href="https://www.aaas.org">https://www.aaas.org</a>	The use of science to realize foreign policy objectives that facilitate peace, sustainable development, and ethical research by leveraging science as a process and method of communication, along with the use of research outcomes. <sup>52</sup> The Center for Science Diplomacy at the American Association for the Advancement of Science (AAAS) is an exemplar entity that has helped bolster scientific and diplomatic community engagement, while building the foundation necessary (e.g., a framework and trainings) for science diplomacy to progress. <sup>16</sup>
Innovation Diplomacy	NESTA (UK) Weblink: <a href="https://www.nesta.org.uk/toolkit/innovation-policy-toolkit-tradecraft-for-innovation-diplomats">https://www.nesta.org.uk/toolkit/innovation-policy-toolkit-tradecraft-for-innovation-diplomats</a>	Innovation diplomacy advances innovation for a specific country through the use of diplomacy, along with the leveraging of innovation for improved relations between countries. <sup>53</sup> It does this through building partnerships with industry, academia, and NGOs; the support of open innovation and collaboration; shaping of intellectual property rights, utilizing ethical regulations and technology; structuring global value chains; as well as the use of innovative solutions to address global issues. <sup>19</sup>
Preventive Diplomacy	American Academy of Diplomacy <a href="https://www.academyofdiplomacy.org">https://www.academyofdiplomacy.org</a>	Preventive Diplomacy has been widely utilized by the UN for decades, defined as actions at the earliest stages of a conflict, with an intent to prevent disputes, as well as prevent existing disputes from escalating into conflicts or from spreading if escalation has already occurred. <sup>54</sup> Preventive Diplomacy has evolved to bring in additional actors and has been implemented in new regions. While it may be difficult to precisely measure the multiple successes of Preventive Diplomacy, it may be less a costly measure compared with other diplomatic approaches or war. <sup>55</sup>
General Diplomacy	United Nations <a href="https://www.un.org">https://www.un.org</a>	Nearly every component of the United Nations (UN) is actively engaged in diplomacy. For instance, the UN budget for conflict prevention missions is approved by the General Assembly, while the Security Council focuses primarily on peace and security issues. The Peacebuilding Commission ensures there is an enduring focus on conflicts. Further, the Office of the Secretary General, envoys, and regional offices all have an essential role in advancing diplomacy.
Public Diplomacy	European Union <a href="https://www.eeas.europa.eu/eeas/public-diplomacy">https://www.eeas.europa.eu/eeas/public-diplomacy</a>	To inform and influence public audiences abroad through the use of transparent methods of communication. Public diplomacy carried out by the European Union (EU) focuses on engaging citizens and key partners across the globe to build trust, understanding, and facilitate future cooperation, which can in turn help address the world's most pressing shared challenges.
Health Attachés	Multiple Countries	As practitioners of health diplomacy, Health Attachés receive official accreditation from governments to carry out the task of connecting public health agencies embedded within one government to public health and related organizations in another. These diplomats, with expertise in public health, must obtain formal credentialing to do this work, which requires agreements between the foreign ministries of the countries involved. <sup>17</sup>
Science, Technology, And Innovation Attachés	Science & Innovation Network, Foreign Office UK <a href="https://www.gov.uk/world/organisations/uk-science-and-innovation-network">https://www.gov.uk/world/organisations/uk-science-and-innovation-network</a>	Drawing on a network of nearly 150 staff in more than 70 countries, the United Kingdom's Science and Innovation Network (or SIN) concentrates on building partnerships and collaborations in science and innovation. The SIN officers partner with the local science and innovation community in each country where they operate to support UK policy interests abroad to promote mutual benefits for the UK and host country.
Digital Diplomacy	Diplo <a href="https://www.diplomacy.edu/topics/digital-diplomacy">https://www.diplomacy.edu/topics/digital-diplomacy</a>	Digital Diplomacy is concentrated in three primary areas: transformations in the environment where diplomacy is carried out, emergence of new issues (or topics) often linked to the internet, and the use of digital tools, such as artificial intelligence (AI) or social media. <sup>56</sup> Relatedly, digital geopolitics and geoeconomics have become increasingly salient as the political and financial power of large technology companies continues to increase. <sup>56</sup>
Economic Diplomacy	Organisation for Economic Cooperation and Development (OECD) Weblink: <a href="https://www.oecd.org/naec">https://www.oecd.org/naec</a>	Economic diplomacy may draw on diplomacy along with economic tools to further the economic, political, and specific strategic goals of a country or multiple countries. For example, to bolster the economy and create jobs through promotion of investment between two or more countries. The approach taken by the Organisation for Economic Co-operation and Development's (OECD) New Approaches to Economic Challenges (NAEC) to cultivate a Brain Capital framework is a prime example of a multinational partnership that draws on economic diplomacy to support an intersectional brain-focused agenda. <sup>12,57</sup>

**Table 1: International models of diplomacy.**

Multi-Partner Consortium to Expand Dementia Research in Latin America (ReD-Lat) and BrainLat were conceptualized and established prior to the pandemic in order to build regional capacity.<sup>8,24</sup> Table 2 provides several examples of BHD ventures that can be leveraged to support increased work in LAC and beyond.

## Diplomacy toolkits

A number of diplomacy-based toolkits have been developed over the past few years, which provide useful examples for Brain Health Diplomat's to draw on in their work. These toolkits are listed in Table 3.

## Brain health resources—resources to support systems thinking for brain health diplomacy

The OECD Systems of Thinking for Policy Makers highlights five key dimensions of inclusivity to help frame any challenge in which systems thinking is implemented.<sup>64</sup> The five dimensions of inclusivity—impacts, feedback, trade-offs, emergencies, and key partners—are outlined below with examples of how they may relate to BHD. These have been adapted from the original created by the OECD.

### Impacts

It is vital to consider the various impacts of a system in order to understand its full potential and influence.



Initiative	Mission
Accelerating COVID-19 Therapeutic Interventions & Vaccines (ACTIV) Weblink: <a href="https://www.nih.gov/research-training/medical-research-initiatives/activ#overview">https://www.nih.gov/research-training/medical-research-initiatives/activ#overview</a>	Accelerating COVID-19 Therapeutic Interventions & Vaccines (ACTIV) is a public-private partnership deployed in response to the COVID-19 pandemic to develop a coordinated research strategy for the fast tracking of promising therapies and vaccines for development.
Alzheimer's Disease Data Initiative (ADDI) Weblink: <a href="https://www.alzheimersdata.org">https://www.alzheimersdata.org</a>	In collaboration with the University of Washington and other partners, an NGO that seeks potential treatments for Alzheimer's disease and related dementias (ADRD). <sup>59</sup> The organization focuses on increasing the global interoperability of data platforms, ADRD-related data sharing across academia and industry, and enabling researchers to work with data that may result in novel ADRD research. ADDI also aspires to address the multiple gaps in existing datasets.
Arts and Brain Weblink: <a href="https://artsandbrain.com">https://artsandbrain.com</a>	Arts and creative practices offer extensive health and wellbeing benefits, fostering behavior change and patient empowerment. GBHI fellows, collaborating with BrainLat, are curating global case studies with psychosocial, cognitive, and therapeutic advantages. Programs address both specific health conditions and general benefits, contributing to resilience. Creative elements have long been employed in health promotion, with potential for large-scale health transformation. This website shares effective practices, highlighting the untapped potential of the arts and creativity in promoting health and wellbeing.
Latin American Brain Health Institute (BrainLat) Weblink: <a href="https://brainlat.uai.cl">https://brainlat.uai.cl</a>	Based at Universidad Adolfo Ibáñez in Chile, the Latin American Brain Health Institute (BrainLat) focuses on enhancing regional and international multidisciplinary brain health research and diplomacy, and has cultivated innovation and new leadership in brain health across the LAC region. The regional dementia research agenda is directly supported by BrainLat via grantmaking, educational infrastructure development, and targeted support for early career researchers. <sup>8</sup>
COVID-19 Vaccines Global Access (COVAX) Weblink: <a href="https://www.who.int/initiatives/act-accelerator/covax">https://www.who.int/initiatives/act-accelerator/covax</a>	COVAX (COVID-19 Vaccines Global Access) is an initiative promoting equitable access to COVID-19 vaccines. Started as a response to the COVID-19 pandemic, COVAX also coordinates international resources to support equitable access to COVID-19 tests, therapies, and vaccines for use in low-to-middle-income countries (LMICs).
Davos Alzheimer's Collaborative (DAC) Weblink: <a href="https://www.davosalzheimerscollaborative.org">https://www.davosalzheimerscollaborative.org</a>	Davos Alzheimer's Collaborative (DAC) is a NGO founded to support people living with Alzheimer's disease and families with the intent to build a robust global response to Alzheimer's disease.
European Academy of Neurology Weblink: <a href="https://www.ean.org">https://www.ean.org</a>	A non-profit organization that works closely with European national neurological societies to advance neurology education and advocacy across Europe.
European Brain Council (EBC) Weblink: <a href="https://www.braincouncil.eu">https://www.braincouncil.eu</a>	The EBC is a network of brain-interested partners, which seeks to promote brain research to improve the lives of Europeans living with both mental and neurological brain conditions. EBC membership includes scientific societies, patient organisations, professional societies, and industry representatives. The EBC emphasizes the importance of continued interaction with European Institutions to build robust European health policies, raise awareness, and encourage brain-focused education.
European Task Force for Brain Health Services	The European Task Force for Brain Health Services is a multinational consortium of health professionals across Europe with a focus on developing and scaling brain health services in order to prevent, evaluate, and treat dementia and cognitive impairment including through the development of so-called 'second-generation' memory clinics. <sup>60,61</sup>
Global Brain Health Institute (GBHI) Weblink: <a href="https://www.gbhi.org">https://www.gbhi.org</a>	A close collaboration between the University of California, San Francisco and Trinity College Dublin, the Global Brain Health Institute (GBHI) brings to bare a unique focus on reducing brain health risk factors and developing a global response to increasing dementia rates. To support this focus, the GBHI trains brain health leaders with a commitment to advancing brain health equity through the Atlantic Fellows for Equity in Brain Health program, which draws participants from multiple countries and professions.
Global CEO Initiative on Alzheimer's Disease (CEOi) Weblink: <a href="https://www.usagainstalzheimer.org/our-enterprise/CEOi">https://www.usagainstalzheimer.org/our-enterprise/CEOi</a>	Led by UsAgainstAlzheimer's, the Global CEO Initiative on Alzheimer's Disease (CEOi) brings together private-sector leaders to provide business leadership to address Alzheimer's and to do so in close collaboration with public sector leadership.
Multi-Partner Consortium to Expand Dementia Research in Latin America (ReD-Lat) Weblink: <a href="https://red-lat.com">https://red-lat.com</a>	ReD-Lat – Multi-Partner Consortium to Expand Dementia Research in Latin America is a multinational research consortium aimed at studying genetic and social determinant risk factors for Alzheimer's disease (AD) and frontotemporal dementia (FTD) in LAC countries. <sup>24</sup>
The European-Latin American Brain Health Academy (ELBHA)	ELBHA, coordinated by BrainLat and GBHI, delivers cutting-edge educational modules for diverse professional groups. ELBHA adopts a transdisciplinary approach, broadening the educational landscape for scientists, policymakers, private organizations, and entrepreneurs in brain health. The Inter-American Development Bank, alongside Argentina's Ministry of Health, provided funding for the ELBHA's inaugural brain health courses. International faculty have designed curricula that cover traditional topics (e.g., dementia research, care, prevention, risk factors, health economics) and novel strategies for fostering brain capital and brain health diplomacy. <sup>8</sup>
United for Global Mental Health Weblink: <a href="https://unitedgmh.org">https://unitedgmh.org</a>	An NGO focused on mental health advocacy with a specific focus on rights, education, systems, and finance in order to achieve the larger goals of reduced stigma and accessible mental health services.
Women's Brain Project Weblink: <a href="https://www.womensbrainproject.com">https://www.womensbrainproject.com</a>	With a specific focus on implementing sex and gender within medicine, this NGO endeavors to assemble a global, multidisciplinary team of experts who work with patients and care partners in order to foster a greater understanding of the role of sex and gender in brain and mental health.

Table 2: Brain health diplomacy case studies (alphabetical order).

Without the consideration of externalities in economics or other domains, it is not possible to understand the full scope of a system and the actual impacts it may have. The boundaries and consideration of the impacts

of systems should be wide in order to be useful in the largest variety of situations and issues.

*BHD Example:* A proposal presented at a conference may not fully capture the contributions of various

Organization	Title	Focus	Purpose
Organisation for Economic Co-Operation and Development (OECD)	OECD Recommendation on Responsible Innovation in Neurotechnology Weblink: <a href="https://www.oecd.org/science/recommendation-on-responsible-innovation-in-neurotechnology.htm">https://www.oecd.org/science/recommendation-on-responsible-innovation-in-neurotechnology.htm</a>	Goal is to guide governments and investors in addressing multiple challenges associated with innovations in neurotechnologies.	By offering nine specific recommendations, this toolkit offers guidance on the entire innovation process, and addresses the need for new innovations particularly in mental health and the study of neurological disorders. <sup>62</sup>
S4D4C	Using Science For/In Diplomacy For Addressing Global Challenges (S4D4C): Toolkits for Trainers Weblink: <a href="https://www.s4d4c.eu/toolkit-for-trainers/">https://www.s4d4c.eu/toolkit-for-trainers/</a>	Discussion and analysis of the multitude of possible uses of system thinking to better understand and address current global challenges. It offers multiple tools, perspectives, and concepts to enhance thinking around the most complex global issues.	Designed to help trainers who seek to plan, design, implement and/or evaluate a training program with a science diplomacy focus. <sup>63</sup>
Organisation for Economic Co-Operation and Development (OECD)	New Approaches to Economic Challenges: Systemic Thinking for Policy Making, The Potential of Systems Analysis for Addressing Global Policy Challenges in the 21st Century Weblink: <a href="https://doi.org/10.1787/879c4f7a-en">https://doi.org/10.1787/879c4f7a-en</a>	Discussion and analysis of the multitude of uses of system thinking to better understand and tackle the problems of the modern world. It offers tools, perspectives, and concepts to improve thinking around complex global issues.	An argument for the potential of systems analysis to impact a variety of topics from sustainability to cities, to the importance of linking education with aging. It also calls for creating new systems and modeling tools, and suggests building new tools and merging existing ones from multiple fields to accomplish this. <sup>64</sup>
Science & Diplomacy	Science and Technology Agreements as Tools for Science Diplomacy: A U.S. Case Study Weblink: <a href="https://www.sciencediplomacy.org/article/2012/science-and-technology-agreements-tools-for-science-diplomacy">https://www.sciencediplomacy.org/article/2012/science-and-technology-agreements-tools-for-science-diplomacy</a>	Offers an argument for the importance of science and technology bilateral agreements between countries as a method for increasing diplomacy and inter-country relationships.	Dolan (2012) provides an argument for the continued use of science and technology bilateral agreements, and offers successful examples of Science and Technology (S&T) agreements where scientific cooperation led to an improved diplomatic relationship. <sup>65</sup>
GESDA Foundation	Geneva Science and Diplomacy Anticipator Weblink: <a href="https://gesda.global/">https://gesda.global/</a>	Through science and diplomacy, a focus on public-private partnerships on an international scale as well as on projects offering solutions to current and future technological challenges, by converting them into opportunities and broadening the scope of possible beneficiaries of scientific and technological advancements.	The GESDA Foundation seeks to use the International Geneva ecosystem as a platform for anticipating, accelerating, and translating the use of emerging science-driven topics into tangible action.
Office of Secretary-General of the UN, Ban Ki-moon	Preventive Diplomacy: Delivering Results Weblink: <a href="https://peacemaker.un.org/node/89">https://peacemaker.un.org/node/89</a>	The purpose of the toolkit is to provide an argument for the necessity of Preventive Diplomacy, and to offer successful examples of use.	In five explicit sections, the toolkit's purpose is to articulate the multiple, beneficial impacts of Preventive Diplomacy, by offering concrete as well as theoretical examples of its use. <sup>65</sup>
World Health Organization (WHO)	Be he@lthy, be mobile: a handbook on how to implement mDementia Weblink: <a href="https://www.who.int/publications/i/item/9789240019966">https://www.who.int/publications/i/item/9789240019966</a>	The mDementia Handbook provides guidance in five key areas: Operations Management; Content development and adaptation; Promotion, participation and retention; Technology specifications, Monitoring and evaluation.	This resource details the mDementia program, which uses mHealth to enhance the support of individuals, families, and care partners of people living with dementia. <sup>66</sup>

Table 3: Relevant diplomacy-based toolkits.

multidisciplinary groups and individuals (e.g., neuroscientists, creatives, etc.) who played a role in its development prior to the final version. Therefore, it is important to acknowledge and consider these diverse inputs to better understand the proposal's broader context and implications to support equity.

## Feedback

It is vital to understand feedback especially when considering long-term impacts; during the short term

a system may be accurate, but it could prove inaccurate or different than intended in the long term. It is also important to remember that feedback loops can be either positive or negative but understanding and paying close attention to feedback is vital to comprehending and analyzing a system.

*BHD Example:* Feedback loops between governments, pharmaceutical companies, and patients. Governments invest in research, which allows new drugs to be created, which in turn help patients.



## Trade offs

Without the consideration of trade-offs and synergies, elements of a system can be missed or not fully considered. With the example of sustainability many corporations often view sustainable practices as detrimental or a negative trade-off, but they are viewed on a broader, world view as positive in the long run.

*BHD Example:* Global partnerships bring new voices and perspectives to the table, fostering collaboration and innovation. This diversity may also present challenges in finding inclusive times and spaces to accommodate the varying needs and preferences of all key partners involved.

## Emergencies

It is important to consider the possibility of emergencies or events that drastically change the system in which they reside. While impossible to always account for what emergencies will entail, systems should be put in place to allow for quicker reactions and responses. Preparedness is key.

*BHD Example:* The existence of climate change creates emergencies that cannot always be planned for. However, crisis management and emergency preparedness officials must be sensitized to the prevalence and particular needs of people living with brain health disorders to mitigate the impacts on these populations.

## Key partners

In any project it is vital to both identify and establish representation of all key partners impacted by a system. Without this consideration, the project or system suffers—both in terms of success in implementation and impact.

*BHD Example:* Brain Health Diplomats, government actors, individuals affected by brain health diseases, pharmaceutical companies, and all citizens impacted by changes to the market (note: only some of the key partners involved).

## Impact evaluation

To maintain and improve brain health at national, regional, and global levels, some impact measurement is needed. At an individual level, this may help to demonstrate to funders or other partners ‘proof of concept’ for a project or intervention. At a meso level, this could include new programs focusing on brain health equity such as funding for cognitive assessments. At a macro level, this might include formal agreements between countries to support commitments to enacting brain-focused public policies or investments in brain-related research or care.

Evaluation materials from multiple sources and organizations are included within the Brain Health Diplomat’s Toolkit. These multiple sources are

provided, which may help to determine the approach that might be most applicable to an individual’s work or research.

## Regional case studies: lessons learned

The multiple examples of success at developing brain health equity in LAC are important to highlight. Two case studies are offered here that are included in the Toolkit, which highlight ongoing work in Peru and Brazil. These two cases specifically highlight opportunities to connect with partners within the region and globally. They also show some of the challenges that may impede efforts to support brain health equity building across the region. A list of other recent, novel projects within LAC is also provided (see Table 4). These are mostly community-designed, emergent projects that have started to utilize basic principles of BHD, including the use of scientific practices to provide direct impact on the specific disparities of a region or community, using convergence science approaches combining different disciplines, providing trans-disciplinary solutions to specific problems, and connecting local actors with organizations working at more abstract levels. These are starting points instead of finished BHD initiatives in settings where continuous and long-term support is needed.

## Case study 1—cognitive health & functional abilities of illiterate, older peruvians in the andes & amazonian regions

This project explores the cognitive health and functional abilities of older Peruvians living with illiteracy. Funded by a Global Brain Health Leader Award, this project led by Maritza Pintado-Caipa, MD, seeks to characterize the cognitive health and functional abilities of rural and urban older adults living with illiteracy in two geoculturally-distinct areas of Peru: the Andean and Amazonian regions. From the onset, the aims of this project were considered ambitious given the need to know and understand how these communities are ageing in a different setting than what is typically found in existing literature.

Drawing on the expertise and support of several global partners including GBHI and the Alzheimer’s Association, along with the guidance and expertise from a regional mentor in Peru and a mentor from the GBHI faculty, was crucial to the project’s success. Further, it was crucial to connect with one of the only two neurologists from the Amazonian region and one of the few neurologists from the Andean region. These connections provided the opportunity to connect with community leaders from rural and urban communities in these regions. This supportive network of advisors provided the opportunity to enter these communities, as well as to develop a better comprehension of their culture, beliefs, customs, language, and unique ways of life.

Country	Project title	Description
Argentina, Multiple Countries	A Novel Deep Learning Algorithm for Classification of Dementia Subtypes Weblink: <a href="https://www.gbhi.org/projects/novel-deep-learning-algorithm-classification-dementia-subtypes">https://www.gbhi.org/projects/novel-deep-learning-algorithm-classification-dementia-subtypes</a>	This initiative has developed a Deep Learning algorithm to classify Alzheimer's and Frontotemporal Dementia using raw brain images, ensuring its generalizability across regions, with plans for a future diagnostic app and a focus on international collaboration to address regional disparities.
Argentina	The Frontotemporal Education Initiative in Argentina for Psychiatrists Weblink: <a href="https://www.gbhi.org/projects/frontotemporal-education-initiative-argentina-psychiatrists">https://www.gbhi.org/projects/frontotemporal-education-initiative-argentina-psychiatrists</a>	The project trains psychiatrists in Argentina on FTD via virtual and in-person methods, building a professional network for improved dementia care, establishing an FTD unit and disease registry, and promoting research and clinical trials, which all align with BHD's aim of fostering open knowledge and international collaboration.
Argentina, Columbia, Multiple Countries	International Network for Language Assessment across Neural Disorders Weblink: <a href="https://www.gbhi.org/projects/international-network-language-assessment-across-neural-disorders">https://www.gbhi.org/projects/international-network-language-assessment-across-neural-disorders</a>	The INCLUDE is a multicentric initiative to identify cross-linguistic markers of neurodegenerative disease. This project demonstrates BHD by fostering international cooperation that is based on enhancing diversity and providing more global views on languages and brain health.
Brazil	Palliative Care in Dementia Weblink: <a href="https://www.gbhi.org/projects/palliative-care-dementia">https://www.gbhi.org/projects/palliative-care-dementia</a>	This project uses chart reviews and interviews to identify care needs, aiming to define optimal palliative care for dementia patients and aligning with BHD by addressing global health challenges locally with scientific interventions.
Brazil	EEG Markers of Apathy in Dementia Weblink: <a href="https://www.gbhi.org/projects/eeg-markers-apathy-dementia">https://www.gbhi.org/projects/eeg-markers-apathy-dementia</a>	This study utilizes a multidimensional assessment of apathy and develops an EEG protocol to evaluate emotional responses in people living with AD and bvFTD, combining insights from neuropsychology, neuropsychiatry, and electrophysiology, reflecting BHD principles by innovatively addressing a local clinical gap in apathy.
Brazil	Cognitive Training to Promote Brain Health Weblink: <a href="https://www.gbhi.org/projects/cognitive-training-promote-brain-health">https://www.gbhi.org/projects/cognitive-training-promote-brain-health</a>	This project will develop and test feasibility of a program to implement individualized brain training for older adults living in Brazil. This project exemplifies the principles of BHD through increased international cooperation to support novel approaches to brain health promotion and dementia risk reduction.
Brazil, Multiple Countries	Basic Literacy, Memory, and Brain Connectivity Weblink: <a href="https://www.gbhi.org/projects/basic-literacy-memory-and-brain-connectivity">https://www.gbhi.org/projects/basic-literacy-memory-and-brain-connectivity</a>	This project examines the impact of late-life basic literacy on memory and brain connections, noting that education, a significant social determinant of health, influences brain functions, especially in low- and middle-income countries facing rising dementia rates; BHD fosters international collaboration in this area.
Colombia	Situational Analysis of Dementia in Colombia Weblink: <a href="https://www.gbhi.org/projects/situational-analysis-dementia-colombia">https://www.gbhi.org/projects/situational-analysis-dementia-colombia</a>	This project will analyze existing data on dementia prevalence, mortality, risk factors, and economic costs, while also addressing social determinants within the Colombian context. By identifying key partners both within and outside the government, the project takes a top-down approach to understand the dementia field in Colombia, reflecting BHD principles in understanding and managing dementia in specific socio-epidemiological contexts.
Colombia	Substance Use in Early-Onset Alzheimer Disease Weblink: <a href="https://www.gbhi.org/projects/substance-use-early-onset-alzheimer-disease">https://www.gbhi.org/projects/substance-use-early-onset-alzheimer-disease</a>	This project examines individuals with the PS1 E280A mutation in Medellín, Colombia, who go through four AD stages. Given that preclinical cognitive decline occurs 12 years before clinical impairment, known as the "Change Point" (CP), this research seeks to understand how substance consumption might influence CP and the onset of these stages. Representing BHD, the study aims to provide global insights for AD prevention and treatment strategies.
Colombia	Family stigma and caregiver burden in early onset dementia Weblink: <a href="https://www.gbhi.org/projects/family-stigma-and-caregiver-burden-early-onset-dementia">https://www.gbhi.org/projects/family-stigma-and-caregiver-burden-early-onset-dementia</a>	This study in Antioquia, Colombia, investigates the interplay between stigma, socioeconomics, and familial caregiver outcomes for EOAD and FTD patients, aiming to inform tailored interventions and health policies in line with BHD principles.
Colombia	Cognitive, Clinical, and Genetic Characterization of Dementia in Colombia <a href="https://www.gbhi.org/projects/cognitive-clinical-and-genetic-characterization-dementia-colombia">https://www.gbhi.org/projects/cognitive-clinical-and-genetic-characterization-dementia-colombia</a>	Using digital cognitive tests and genetic risk assessment, this project seeks to enable early and accurate dementia diagnoses in Colombia, clearly representing BHD principles by aiming to reduce brain health inequities with findings that have global implications.
Costa Rica	ISM: An Intergenerational Montessori-Based Approach for Successful Aging Weblink: <a href="https://www.gbhi.org/projects/ism-intergenerational-montessori-based-approach-successful-aging">https://www.gbhi.org/projects/ism-intergenerational-montessori-based-approach-successful-aging</a>	This feasibility study in Costa Rica, uses Montessori principles to train elders as mentors for preschoolers, exemplifying BHD by promoting intergenerational brain health insights globally.
Cuba, Multiple Countries	Communicating dementia risk in low- and middle-income countries Weblink: <a href="https://www.gbhi.org/projects/communicating-dementia-risk-low-and-middle-income-countries">https://www.gbhi.org/projects/communicating-dementia-risk-low-and-middle-income-countries</a>	Using data from the Cuban cohort of the 10/66 Dementia Research Group, this project aims to create a tool for clinicians to communicate dementia risks to patients, inform prevention strategies, and potentially adapt for broader use in LMICs, reflecting BHD's goal of global collaboration and knowledge exchange in dementia prevention.
Cuba	The Brain Health Assessment for diagnosis of MCI-Dementia in Primary Care Weblink: <a href="https://www.gbhi.org/projects/brain-health-assessment-diagnosis-mci-dementia-primary-care">https://www.gbhi.org/projects/brain-health-assessment-diagnosis-mci-dementia-primary-care</a>	Aiming to validate the Brain Health Assessment for the Cuban population, this project recruits participants at the community level to develop and validate a cost-effective digital cognitive assessment tool for MCI and Dementia, enhancing equitable dementia diagnosis and care in LMICs, exemplifying BHD's vision of globally adaptable solutions.
Ecuador	Dementia Diagnosis Training Project in Ecuador Weblink: <a href="https://www.gbhi.org/projects/dementia-diagnosis-training-project-ecuador">https://www.gbhi.org/projects/dementia-diagnosis-training-project-ecuador</a>	This project crafts a dementia training curriculum for Ecuadorian primary care physicians, aiming to enhance nationwide dementia diagnosis and care, in line with BHD's vision of boosting local healthcare through international collaboration.
Ecuador	Characterizing the Neurocognitive and Social Health in Ecuador Weblink: <a href="https://www.gbhi.org/projects/characterizing-neurocognitive-and-social-health-ecuador">https://www.gbhi.org/projects/characterizing-neurocognitive-and-social-health-ecuador</a>	This project seeks to refine the Ecuadorian National Survey of Well-being and Aging's cognitive assessment battery, emphasizing BHD's values through international collaboration and advocating for equitable brain health resources in diverse Ecuadorian communities.

(Table 4 continues on next page)

Country	Project title	Description
(Continued from previous page)		
Mexico	Frequency and Determinants of Vascular Cognitive Impairment in Post Stroke Weblink: <a href="https://www.gbhi.org/projects/frequency-and-determinants-vascular-cognitive-impairment-post-stroke">https://www.gbhi.org/projects/frequency-and-determinants-vascular-cognitive-impairment-post-stroke</a>	This study examines the risk factors and prevalence of post-stroke dementia and vascular cognitive impairment in Mexico City, advancing BHD principles through region-specific insights and global collaboration.
Mexico	Gut Microbiome Intervention for People Living and Aging with HIV Infection Weblink: <a href="https://www.gbhi.org/projects/gut-microbiome-restoration-elders-hiv-associated-cognitive-disorder">https://www.gbhi.org/projects/gut-microbiome-restoration-elders-hiv-associated-cognitive-disorder</a>	This in Mexico study participants to evaluate probiotics' effects on cognitive health in those aging with HIV, championing BHD's focus on global dementia prevention, health equity, and international collaboration.
Mexico	Evaluating a decision aid for families of patients with advanced dementia Weblink: <a href="https://www.gbhi.org/projects/evaluating-decision-aid-families-patients-advanced-dementia">https://www.gbhi.org/projects/evaluating-decision-aid-families-patients-advanced-dementia</a>	This project evaluates an audiovisual decision-aid for surrogates of dementia patients in Mexico to enhance end-of-life decisions and communication, aligning with the focus of BHD on underserved communities.
Mexico	Characterizing Mistreatment in Mexican Cognitively Impaired Older Adults Weblink: <a href="https://www.gbhi.org/projects/characterizing-mistreatment-mexican-cognitively-impaired-older-adults">https://www.gbhi.org/projects/characterizing-mistreatment-mexican-cognitively-impaired-older-adults</a>	This study evaluates cognitive impairment and mistreatment in 198 Mexican caregiver-care recipient dyads, emphasizing BHD's commitment to brain health and the protection of vulnerable groups.
Nicaragua	Virtual Initiative for Training to Informal Caregivers and Families Weblink: <a href="https://www.gbhi.org/projects/virtual-initiative-training-informal-caregivers-and-families">https://www.gbhi.org/projects/virtual-initiative-training-informal-caregivers-and-families</a>	This project crafts a culturally tailored virtual training program in Managua, Nicaragua, to improve care for people living with Alzheimer's and care partners, embodying the BHD focus on global collaboration and cultural sensitivity.
Peru	LimaFTD Network: Improving Diagnosis of FTD in Underserved Settings Weblink: <a href="https://www.gbhi.org/projects/limaftd-network-improving-diagnosis-ftd-underserved-settings">https://www.gbhi.org/projects/limaftd-network-improving-diagnosis-ftd-underserved-settings</a>	This project establishes the LimaFTD Network in Lima, Peru, to enhance frontotemporal dementia detection and consider sociocultural influences on diagnosis, emphasizing the commitment of BHD to international collaboration and cultural sensitivity in brain health.
Peru	A Novel Program to Promote Independence in Older Adults with Dementia Weblink: <a href="https://www.gbhi.org/projects/novel-program-promote-independence-older-adults-dementia">https://www.gbhi.org/projects/novel-program-promote-independence-older-adults-dementia</a>	This Peruvian project introduces a personalized ambulatory program for neurocognitive impairment care, focusing on patient independence and care partner support, embodying BHD's principles of agile, evidence-based dementia care.

**Table 4: Regional brain health diplomacy exemplars, by country (alphabetical order).**

A challenge of working in these underserved areas is the comprehension and discourse surrounding brain health. For many people the topic of brain health, both for themselves and other members of their communities, is not understood. For many, it is unclear why the brain should be a focal point for assessment or care.

This situation is understandable, when people are struggling day-to-day to cover other needs that often take priority, like the effects of poverty, a lack of access to healthcare, and other types of disabilities such as hearing, visual, motor, or other functional impairments, which all put brain health at-risk. The situation exemplifies why the challenge of cognitive health takes a multi-national, multidisciplinary approach which utilizes the principles of BHD and must follow a multi-focus perspective where all partners have an active and collaborative role in advancing equity in brain health.

### Case study 2—diagnosing cognitive impairment in older Brazilians with low education attainment

In Brazil, the number of people aged 60 years or older increased by 41.6% between 2000 and 2010. With an increase in longevity, more Brazilians are living with dementia. It's been estimated that 77% of those individuals have not been diagnosed.<sup>67</sup> Low educational attainment is a strong predictor of the incidence and

prevalence of Alzheimer's disease.<sup>68-72</sup> Diagnosing dementia among persons with low educational attainment is complicated because low education is associated with poorer cognitive test performance.<sup>73,74</sup>

This reinforces the need for tests that are less vulnerable to educational experience and for normative values corrected for education.<sup>75</sup> In partnership between two universities, one located in the United States (University of California, San Francisco) and the other located in Brazil (University of São Paulo), in the Cognitive Neurology and Behavioral Unit (GNCC), the project, led by Maira Okada de Oliveira, PhD, was developed to detect cognitive impairment in Brazilians with low educational attainment.

The project compares the classification accuracy of paper based, manual-based, and tablet-based approaches for detecting dementia by education level. Findings will guide the appropriate selection of brief cognitive assessments. Findings will also improve dementia detection in Brazil. The overall aim of this project is to guide the selection of brief cognitive assessments for use in dementia diagnosis with members of the Brazilian population with low educational attainment. Drawing on the BHD framework described in the Toolkit will help achieve this by cultivating a network of multi-disciplinary professionals (e.g., neuropsychologists, neurologists, speech therapists, geriatricians, primary care physicians) across Brazil who are leaders in their respective

communities and who will implement a unified form of evaluation. The long-term goal is to create a large network across low- and middle-income countries to advance cognitive assessments with a focus on the most vulnerable populations. Drawing on the principles of the BHD framework can support the development of necessary partnerships across multiple countries to establish this network through close collaboration with regional organizations such as ReD-Lat.

### Implementation of brain health diplomacy in LAC and beyond

The BHD team is focused on developing current and future BHD initiatives. For instance, the team has provided BHD actions oriented to bring together policy actors, implement multilevel effects, and offer concrete solutions to support brain health. These actions include a regional plan for dementia,<sup>76</sup> a proposal for care partner solutions in the LAC region,<sup>14</sup> and an urgent coordinated response to address the unique impacts of COVID-19 on ageing and dementia across underserved populations.<sup>77,78</sup> The BHD website ([brainhealthdiplomacy.com](http://brainhealthdiplomacy.com)) also provides resources, examples of applications, and the basis of a network to collaborate and expand different local initiatives. Moving forward, the next practical application of this work may be the call to establish a brain-health-in-all-policies task force for the LAC region. This task force could involve national governments, the InterAmerican Development Bank, universities, and think tanks from the region along with global partners.

### Barriers to implementing brain health diplomacy and strategies to overcome

The widespread adoption of the BHD model in LAC and globally is a highly ambitious goal yet necessary given the growing magnitude of challenges and opportunities associated with the brain. Multiple barriers to actualizing the BHD vision range from the social (or cultural) to the economic to the political, which may in turn impede improved brain health outcomes. To overcome the multiple barriers to broadly implementing BHD, a convergence approach that draws on increased collaboration and focuses on strengthening networks across the region and world is essential. While these barriers are complex and often interconnected, we identify several pressing challenges and outline approaches to help overcome these barriers.

#### Cultural barriers

The way brain health and dementia are understood varies across cultures and countries and could impede the success of some projects as well as the wider adoption of the convergence approach to BHD. Dementia, for example, may be viewed as an inevitable part of the ageing process rather than a public health issue.<sup>79</sup>

Challenging stigma about dementia and the brain whenever possible must take place. To do this, a continued focus on raising awareness of brain health as a key pillar of overall health is needed. This aligns with the WHO's publication, *Optimizing Brain Health Across the Life Course: WHO Position Paper*.<sup>28</sup>

#### Political barriers

Building political support for brain health-focused policies, programs, and initiatives may be difficult when there are other multiple, competing priorities that policymakers must address. Other priorities may appear more immediate than brain health—economic growth for example or investment in education systems. Much like climate change, brain health may be recognized as both an immediate and long-term threat, while to others it may be recognized as a vaguely distant concern. Navigating these dynamics, and the processes for getting onto the policy agenda, differs across countries and must take the unique political arrangements and environment into account.

To overcome the political hurdles to implementing BHD, building coalitions with key partners to support and advocate for brain health-directed policy is essential. These coalitions may draw together a multitude of societal groups and organizations taking an intergenerational (e.g., children and older adults), multidisciplinary (e.g., public policy and neuroscience), and/or multi-sectoral (e.g., business and research) approach. This convergence approach is a key tenant of BHD and why this framework is important. Further, intersections with other policy domains may be an opportunity to address brain health. For example, the development of national health systems may be a clearer health-related policy objective to policymakers. These are not mutually exclusive objectives. Integrating brain health into the development and refinement of health systems may offer an effective strategy to ensure brain health is included in national policy agendas.

#### Economic Barriers

The upfront costs of new programs and interventions are often high and may be a barrier for many countries and localities to implement.

Demonstrating the economic impact—including potential cost savings—of brain health by investing in prevention and risk reduction, research, and the adoption of low-cost, high impact care models is also essential. These approaches can help make the economic case for brain health and where the Brain Capital framework can also be highly beneficial for understanding the brain's centrality in economic thinking.<sup>12,57</sup>

### Summary & conclusions

Diplomacy is necessary to transcend disciplinary and geographic boundaries and to mobilize resources to

improve global brain health. This approach is essential to advance equity in brain health outcomes worldwide. At a regional or global level, collective actions such as formal agreements between countries that require the measurement of cognitive function within national health systems, or the inclusion of other brain health metrics should be considered.

Some of the highest needs for brain health-related actions globally are in LAC. The Brain Health Diplomat's Toolkit seeks to provide emerging brain health leaders and other professionals whose work intersect with brain health across LAC the tools to practice BHD. To support this vision, the Toolkit offers a practical, tangible resource for emerging leaders to apply BHD concepts within their professional work and collaborations including advocacy on behalf of international agreements between countries to support brain health policies and investments.

Brain health diplomacy offers multiple opportunities for collaboration and development of new partnerships across LAC and beyond. There are abundant policy-related opportunities to apply BHD within scientific, policy, and advocacy settings, to promote brain health across the life course. This could begin with the establishment of a regional task force on a brain-health-in-all-policies agenda. Moreover, there are innumerable opportunities to scale BHD to other regions of the world. The BHD team encourages dialogue, ideation, and cross-sector discussion for planning how to develop new avenues of research, policy, and program development through BHD. Additional formal talks and conferences involving key partners from government, the private sector, and research are needed. Ultimately, the best ideas for advancing global brain health are yet to come from these new partnerships.

#### Contributors

Funding acquisition: WD, LB, HE, MPC, MO, IR, LS.

Conceptualization: LB, WD, HE, AI, LS, IR, MPC, MO, Data curation: NS, MPC, MO, LB, WD, HE, AI, MC, AD, MVM, RK, Formal analysis: WD, NS, LB, AI.

Methodology: WD, NS, LB, HE, AI.

Project administration: WD, LB, NS, AI, OG, AD, MC, RK, MVM, AK, Visualization: AK, OG, AI.

Writing—original draft: WD, LB, HE, AI, MPC, MO.

Writing—review & editing: OG, LB, NS, AI, WD, MC, AD, MVM, RK, MO, MPC.

The content of this work is solely the responsibility of the authors and does not represent the official views of these institutions. We used a large language model (LLM) in this work to detect language typos and revise code.

#### Declaration of interests

AI is partially supported by grants of ANID-FONDEF [20110152]; FONCYT-PICT [2017–1818, 2017–1820]; ANID/FONDECYT Regular [1,210,195, 1,210,176, 1,220,995]; ANID/FONDAP [15,150,012]; ANID/PIA/ANILLOS ACT210096; and the Multi-Partner Consortium to Expand Dementia Research in Latin America (ReDLat), funded by the National Institutes of Aging of the National Institutes of Health and Fogarty International Center (FIC) under award number R01AG057234, an Alzheimer's Association grant [SG-20-725707-ReDLat], the Rainwater

Foundation, and the Global Brain Health Institute (GBHI). AI reports consulting fees from Roche, Lilly, Cumulus, unrelated to this work.

WD is partially supported by grants and contracts with Oregon Health Authority (Interagency Agreement #171319); Global Brain Health Institute/Alzheimer's Association Award (GBHI ALZ UK-20-640,170); the American Nurses Foundation (PI:Izumi), National Institute on Aging (Kaye) NIA P30 AG024978-18, and the Latin American Brain Health Institute (BrainLat) (#BL-SRGP2021-03).

LB is partially supported by grants with the Latin American Brain Health Institute (BrainLat) (#BL-SRGP2021-03) and reports a grant from the Global Brain Health Institute (GBHI) related to this work.

AK reports payment from the Global Brain Health Institute (GBHI) related to this work.

MO reports payment from the Latin American Brain Health Institute (BrainLat) (#BL-SRGP2021-03) related to this work.

MPC reports payment from the Latin American Brain Health Institute (BrainLat) (#BL-SRGP2021-03) related to this work.

HE reports consulting fees from Kooth LLC and payment/honoraria from Roche, Novo Nordisk, and Lundbeck, unrelated to this work.

**Authors:** Walter D. Dawson (WD), Laura Booi (LB), Maritza Pintado-Caipa (MPC), Maira Okada de Oliveira (MO), Alex Kornhuber (AK), Natasha Spoden (NS), Ona Golonka (OG), Lenny Shallcross (LS), Alejandra Davidziuk (AD), Márcia Cominetti (MC), Mayte Vergara-Manríquez (MVM), Renata Kochhann (RK), Ian Robertson (IR), Harris A. Eyre (HE), Agustín Ibáñez (AI).

#### Acknowledgements

The authors wish to thank the multiple content experts who reviewed the BHD Toolkit and provided insightful feedback. These reviewers include María E. Castelló, Mario A Parra, Alvaro Fernandez, Claudia Duran-Aniotz, Virginia Bennett, Johana Cabrera Medina, Jeffrey Kaye, Lea Grinberg, Adolfo M. García, Joshua Armstrong, Vanessa De la Cruz-Góngora, J. Jaime Miranda, and Tomás León.

Funding acknowledgements: Funding for this project generously provided by the Latin American Brain Health Institute (BrainLat) (#BL-SRGP2021-03) at Universidad Adolfo Ibáñez and the Global Brain Health Institute (GBHI). The Layton Aging & Alzheimer's Disease Research Center at Oregon Health & Science University (OHSU) and the Centre for Dementia Research at Leeds Beckett University provided additional support in-kind.

#### References

- Hwang TJ, Rabheru K, Peisah C, Reichman W, Ikeda M. Loneliness and social isolation during the COVID-19 pandemic. *Int Psychogeriatr.* 2020;32(10):1217–1220. <https://doi.org/10.1017/S1041610220000988>.
- Taquet M, Sillett R, Zhu L, et al. Neurological and psychiatric risk trajectories after SARS-CoV-2 infection: an analysis of 2-year retrospective cohort studies including 1 284 437 patients. *Lancet Psychiatry.* 2022;9(10):815–827. [https://doi.org/10.1016/S2215-0366\(22\)00260-7](https://doi.org/10.1016/S2215-0366(22)00260-7).
- Fotuhi M, Mian A, Meysami S, Raji CA. Neurobiology of COVID-19. *J Alzheim Dis.* 2020;76:3–19. <https://doi.org/10.3233/JAD-200581>.
- Becker JH, Lin JJ, Doernberg M, et al. Assessment of cognitive function in patients after COVID-19 infection. *JAMA Netw Open.* 2021;4(10):e2130645. <https://doi.org/10.1001/jamanetworkopen.2021.30645>.
- Stephan BCM, Pakpahan E, Siervo M, et al. Prediction of dementia risk in low-income and middle-income countries (the 10/66 Study): an independent external validation of existing models. *Lancet Global Health.* 2020;8(4):e524–e535. [https://doi.org/10.1016/s2214-109x\(20\)30062-0](https://doi.org/10.1016/s2214-109x(20)30062-0).
- Nichols E, Steinmetz JD, Vollset SE, et al. Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease Study 2019. *Lancet Public Health.* 2022;7(2):e105–e125. [https://doi.org/10.1016/S2468-2667\(21\)00249-8](https://doi.org/10.1016/S2468-2667(21)00249-8).
- Mario AP, Sandra B, Ricardo A, et al. Dementia in Latin America. *Neurology.* 2018;90(5):222. <https://doi.org/10.1212/WNL.0000000000004897>.



- 8 Duran-Aniotz C, Sanhueza J, Grinberg LT, et al. The Latin American Brain Health Institute, a regional initiative to reduce the scale and impact of dementia. *Alzheimer's Dementia*. 2022;18(9):1696–1698. <https://doi.org/10.1002/alz.12710>.
- 9 Santamaria-García H, Sainz-Ballesteros A, Hernandez H, et al. Factors associated with healthy aging in Latin American populations. *Nat Med*. 2023;29(9):2248–2258. <https://doi.org/10.1038/s41591-023-02495-1>.
- 10 Ibanez A, Legaz A, Ruiz-Adame M. Addressing the gaps between socioeconomic disparities and biological models of dementia. *Brain*. 2023;146(9):3561–3564. <https://doi.org/10.1093/brain/awad236>.
- 11 Dawson WD, Bobrow K, Ibáñez A, et al. The necessity of diplomacy in brain health. *Lancet Neurol*. 2020;19(12):972–974. [https://doi.org/10.1016/S1474-4422\(20\)30358-6](https://doi.org/10.1016/S1474-4422(20)30358-6).
- 12 Smith E, Ali D, Wilkerson B, et al. A brain capital grand strategy: toward economic reimagining. *Mol Psychiatry*. 2021;26(1):3–22. <https://doi.org/10.1038/s41380-020-00918-w>.
- 13 Ternes K, Iyengar V, Lavretsky H, et al. Brain health INnovation Diplomacy: a model binding diverse disciplines to manage the promise and perils of technological innovation. *Int Psychogeriatr*. 2020;32(8):955–979. <https://doi.org/10.1017/S1041610219002266>.
- 14 Ibáñez A, Pina-Escudero SD, Possin KL, et al. Dementia caregiving across Latin America and the Caribbean and brain health diplomacy. *Lancet Healthy Longev*. 2021;2(4):e222–e231. [https://doi.org/10.1016/S2666-7568\(21\)00031-3](https://doi.org/10.1016/S2666-7568(21)00031-3).
- 15 Katz R, Kornblet S, Arnold G, Lief E, Fischer JE. Defining health diplomacy: changing demands in the era of globalization. *Milbank Q*. 2011;89(3):503–523. <https://doi.org/10.1111/j.1468-0009.2011.00637.x>.
- 16 Science AaftAo. Center for science diplomacy. <https://www.aaas.org/programs/center-science-diplomacy/about>. Accessed April 19, 2022.
- 17 Kickbusch I, Silberschmidt G, Buss P. Global health diplomacy: the need for new perspectives, strategic approaches and skills in global health. *Bull World Health Organ*. 2007;85(3):230–232. <https://doi.org/10.2471/BLT.06.039222>.
- 18 Kickbusch I, Liu A. Global health diplomacy—reconstructing power and governance. *Lancet*. 2022;399(10341):2156–2166. [https://doi.org/10.1016/S0140-6736\(22\)00583-9](https://doi.org/10.1016/S0140-6736(22)00583-9).
- 19 Leijten J. Exploring the future of innovation diplomacy. *Eur J Futures Res*. 2017;5(1):20. <https://doi.org/10.1007/s40309-017-0122-8>.
- 20 Turekian V. The evolution of science diplomacy. *Global Policy*. 2018;9(5):5–7. <https://doi.org/10.1111/1758-5899.12622>.
- 21 Ruffini P-B. Conceptualizing science diplomacy in the practitioner-driven literature: a critical review. *Humanit Soc Sci Commun*. 2020;7(1):124. <https://doi.org/10.1057/s41599-020-00609-5>.
- 22 Holford M, Nichols RW. The challenge of building science diplomacy capabilities for early career academic investigators. *Science Diplom*. 2017;6(4).
- 23 Prince M, Brodaty H, Uwakwe R, et al. Strain and its correlates among carers of people with dementia in low-income and middle-income countries. A 10/66 Dementia Research Group population-based survey. *Int J Geriatr Psychiatry*. 2012;27(7):670–682. <https://doi.org/10.1002/gps.2727>.
- 24 Ibáñez A, Yokoyama JS, Possin KL, et al. The multi-partner Consortium to expand dementia research in Latin America (ReDLat): driving multicentric research and implementation science. *Front Neurol*. 2021;2:631722.
- 25 Ibanez A, Zimmer E. Time to synergize mental health with brain health. *Nat Ment Health*. 2023;1:441–443. <https://doi.org/10.1038/s44220-023-00086-0>.
- 26 Livingston G, Sommerlad A, Orgeta V, et al. Dementia prevention, intervention, and care. *Lancet*. 2017;390(10113):2673–2734. [https://doi.org/10.1016/s0140-6736\(17\)31363-6](https://doi.org/10.1016/s0140-6736(17)31363-6).
- 27 Livingston G, Huntley J, Sommerlad A, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*. 2020;396(10248):413–446. [https://doi.org/10.1016/S0140-6736\(20\)30367-6](https://doi.org/10.1016/S0140-6736(20)30367-6).
- 28 World Health Organization. *Optimizing brain health across the life course: WHO position paper*; 2022. <https://www.who.int/publications/i/item/9789240054561>.
- 29 Ju YE, Lucey BP, Holtzman DM. Sleep and Alzheimer disease pathology—a bidirectional relationship. *Nat Rev Neurol*. 2014;10(2):115–119. <https://doi.org/10.1038/nrneurol.2013.269>.
- 30 Lupien SJ, McEwen BS, Gunnar MR, Heim C. Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nat Rev Neurosci*. 2009;10(6):434–445. <https://doi.org/10.1038/nrn2639>.
- 31 Barbiellini Amidei C, Fayosse A, Dumurgier J, et al. Association between age at diabetes onset and subsequent risk of dementia. *JAMA*. 2021;325(16):1640–1649. <https://doi.org/10.1001/jama.2021.4001>.
- 32 Norton S, Matthews FE, Barnes DE, Yaffe K, Brayne C. Potential for primary prevention of Alzheimer's disease: an analysis of population-based data. *Lancet Neurol*. 2014;13(8):788–794. [https://doi.org/10.1016/S1474-4422\(14\)70136-X](https://doi.org/10.1016/S1474-4422(14)70136-X).
- 33 Qiu C, Winblad B, Fratiglioni L. The age-dependent relation of blood pressure to cognitive function and dementia. *Lancet Neurol*. 2005;4(8):487–499. [https://doi.org/10.1016/S1474-4422\(05\)70141-1](https://doi.org/10.1016/S1474-4422(05)70141-1).
- 34 Solfrizzi V, Custodero C, Lozupone M, et al. Relationships of dietary patterns, foods, and micro- and macronutrients with Alzheimer's disease and late-life cognitive disorders: a systematic review. *J Alzheim Dis*. 2017;59:815–849. <https://doi.org/10.3233/JAD-170248>.
- 35 Lott IT, Head E. Dementia in Down syndrome: unique insights for Alzheimer disease research. *Nat Rev Neurol*. 2019;15(3):135–147. <https://doi.org/10.1038/s41582-018-0132-6>.
- 36 Wang HX, Wahlberg M, Karp A, Winblad B, Fratiglioni L. Psychosocial stress at work is associated with increased dementia risk in late life. *Alzheimers Dement*. 2012;8(2):114–120. <https://doi.org/10.1016/j.jalz.2011.03.001>.
- 37 Cadar D, Lassale C, Davies H, Llewellyn DJ, Batty GD, Steptoe A. Individual and area-based socioeconomic factors associated with dementia incidence in england: evidence from a 12-year follow-up in the English longitudinal study of ageing. *JAMA Psychiatr*. 2018;75(7):723–732. <https://doi.org/10.1001/jamapsychiatry.2018.1012>.
- 38 Killin LOJ, Starr JM, Shiue JJ, Russ TC. Environmental risk factors for dementia: a systematic review. *BMC Geriatr*. 2016;16(1):175. <https://doi.org/10.1186/s12877-016-0342-y>.
- 39 World Health Organization. *Global action plan on the public health response to dementia 2017–2025*; 2017. <https://www.who.int/publications/i/item/global-action-plan-on-the-public-health-response-to-dementia-2017–2025>. Accessed October 18, 2022.
- 40 Borelli WV, Leotti VB, Strelow MZ, Chaves MLF, Castilhos RM. Preventable risk factors of dementia: population attributable fractions in a Brazilian population-based study. *Lancet Reg Health Am*. 2022;11:100256. <https://doi.org/10.1016/j.lana.2022.100256>.
- 41 Majoka MA, Schimming C. Effect of social determinants of health on cognition and risk of alzheimer disease and related dementias. *Clin Ther*. 2021;43(6):922–929. <https://doi.org/10.1016/j.clinthera.2021.05.005>.
- 42 Wilson RS, Hebert LE, Scherr PA, Barnes LL, Leon CFM, Evans DA. Educational attainment and cognitive decline in old age. *Neurology*. 2009;72(5):460. <https://doi.org/10.1212/01.wnl.0000341782.71418.6c>.
- 43 Goldberg TE, Choi J, Lee S, Gurland B, Devanand DP. Effects of restriction of activities and social isolation on risk of dementia in the community. *Int Psychogeriatr*. 2021;33(11):1207–1215. <https://doi.org/10.1017/S1041610221000776>.
- 44 Cohen AJ, Brauer M, Burnett R, et al. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. *Lancet*. 2017;389(10082):1907–1918. [https://doi.org/10.1016/S0140-6736\(17\)30505-6](https://doi.org/10.1016/S0140-6736(17)30505-6).
- 45 Dos Santos NV, Yariwake VY, Marques KdV, Veras MM, Fajersztajn L. Air pollution: a neglected risk factor for dementia in Latin America and the caribbean. Hypothesis and theory. *Front Neurol*. 2021;12. <https://doi.org/10.3389/fneur.2021.684524>.
- 46 Solares C, Garcia-Argibay M, Chang Z, Dobrosavljevic M, Larsson H, Andershed H. Risk of dementia and mild cognitive impairment in older adults with a criminal background: a population-based register study in Sweden. *Sci Rep*. 2023;13(1):1915. <https://doi.org/10.1038/s41598-023-28962-w>.
- 47 Yaffe K, Falvey C, Harris TB, et al. Effect of socioeconomic disparities on incidence of dementia among biracial older adults: prospective study. *BMJ*. 2013;347:f7051. <https://doi.org/10.1136/bmj.f7051>.
- 48 Shreya L, Alise KC, Abhilash S, et al. Impacts of climate change and air pollution on neurologic health, disease, and practice. *Neurology*. 2023;100(10):474. <https://doi.org/10.1212/WNL.0000000000201630>.



- 49 Raza Z, Hussain SF, Ftouni S, et al. Dementia in military and veteran populations: a review of risk factors—traumatic brain injury, post-traumatic stress disorder, deployment, and sleep. *Military Medical Research*. 2021;8(1):55. <https://doi.org/10.1186/s40779-021-00346-z>.
- 50 Marshall CR, Noyce AJ, Neligan A, Dobson R. Brain health: the hidden casualty of a humanitarian crisis. *Lancet Regional Health Europe*. 2022;15:100374. <https://doi.org/10.1016/j.lanepe.2022.100374>.
- 51 Torres JM, Casey JA. The centrality of social ties to climate migration and mental health. *BMC Public Health*. 2017;17(1):600. <https://doi.org/10.1186/s12889-017-4508-0>.
- 52 UNESCO; Science Policy. Science, policy and society. [https://en.unesco.org/science-policy/science\\_policy\\_society](https://en.unesco.org/science-policy/science_policy_society). Accessed October 18, 2023.
- 53 Miremadi T. A model for science and technology diplomacy: how to align the rationales of foreign policy and science; 2016. <https://ssrn.com/abstract=2737347>. Accessed October 20, 2023.
- 54 Boutros-Ghali B. An agenda for peace: preventive diplomacy, peace-making and peace-keeping. *Int Relat*. 1992/12/01 1992;11(3):201–218. <https://doi.org/10.1177/004711789201100302>.
- 55 Ban K-m. Preventive diplomacy: delivering results; 2011. [https://peacemaker.un.org/sites/peacemaker.un.org/files/SGReport\\_PreventiveDiplomacy\\_S2011552%28english%29.pdf](https://peacemaker.un.org/sites/peacemaker.un.org/files/SGReport_PreventiveDiplomacy_S2011552%28english%29.pdf). Accessed April 20, 2022.
- 56 Diplo. Digital diplomacy. <https://www.diplomacy.edu/topics/digital-diplomacy/>. Accessed April 19, 2023.
- 57 Dawson WD, Smith E, Booi L, et al. Investing in late-life brain capital. *Innov Aging*. 2022;6(3):igac016. <https://doi.org/10.1093/geroni/igac016>.
- 58 Smith D. The next generation of leaders advocating for brain health. *Lancet Neurol*. 2018;17(1):29–30. [https://doi.org/10.1016/S1474-4422\(17\)30359-9](https://doi.org/10.1016/S1474-4422(17)30359-9).
- 59 Alzheimer's Disease Data Initiative. <https://www.alzheimersdata.org/>. Accessed April 20, 2022.
- 60 Altomare D, Molinuevo JL, Ritchie C, et al. Brain Health Services: organization, structure, and challenges for implementation. A user manual for Brain Health Services—part 1 of 6. *Alzheimer's Res Ther*. 2021;13(1):168. <https://doi.org/10.1186/s13195-021-00827-2>.
- 61 Frisoni GB, Altomare D, Ribaldi F, et al. Dementia prevention in memory clinics: recommendations from the European task force for brain health services. *Lancet Reg Health Eur*. 2023;26. <https://doi.org/10.1016/j.lanepe.2022.100576>.
- 62 Recommendation of the council on responsible innovation in neurotechnology, OECD/LEGAL/0457 (OECD). <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457>; 2022. Accessed October 20, 2023.
- 63 Josten M, Meyer N, Müller AP, et al. *Teaching Science Diplomacy: planning, designing, delivering and evaluating training activities on Science Diplomacy. Proposal for a curriculum and toolkit for trainers. S4D4C Deliverable 5.2*; 2020. Using science for/in diplomacy for addressing global challenges (S4D4C). <https://www.s4d4c.eu/toolkit-for-trainers/>.
- 64 Hynes W, Lees M, Müller J. *Systemic thinking for policy making: the potential of systems analysis for addressing global policy challenges in the 21st century*. OECD Publishing; 2020.
- 65 Dolan B. Science and technology agreements as tools for science diplomacy: a US Case Study. *Science Diplom*. 2012;1(4). <https://www.sciencediplomacy.org/article/2012/science-and-technology-agreements-tools-for-science-diplomacy>. Accessed October 20, 2023.
- 66 World Health Organization. *International telecommunication U Be he@lthy, be mobile: a handbook on how to implement mDementia*. World Health Organization; 2021. <https://www.who.int/publications/i/item/9789240019966>. Accessed October 20, 2023.
- 67 Nakamura AE, Opaleye D, Tani G, Ferri CP. Dementia underdiagnosis in Brazil. *Lancet*. 2015;385(9966):418–419. [https://doi.org/10.1016/S0140-6736\(15\)60153-2](https://doi.org/10.1016/S0140-6736(15)60153-2).
- 68 Barnes DE, Yaffe K. The projected effect of risk factor reduction on Alzheimer's disease prevalence. *Lancet Neurol*. 2011;10(9):819–828. [https://doi.org/10.1016/S1474-4422\(11\)70072-2](https://doi.org/10.1016/S1474-4422(11)70072-2).
- 69 Larson EB, Yaffe K, Langa KM. New insights into the dementia epidemic. *N Engl J Med*. 2013;369(24):2275–2277. <https://doi.org/10.1056/NEJMp1311405>.
- 70 Beydoun MA, Beydoun HA, Gamaldo AA, Teel A, Zonderman AB, Wang Y. Epidemiologic studies of modifiable factors associated with cognition and dementia: systematic review and meta-analysis. *BMC Public Health*. 2014;14(1):643. <https://doi.org/10.1186/1471-2458-14-643>.
- 71 Nitri R, Bottino CM, Albala C, et al. Prevalence of dementia in Latin America: a collaborative study of population-based cohorts. *Int Psychogeriatr*. 2009;21(4):622–630. <https://doi.org/10.1017/s1041610209009430>.
- 72 César-Freitas KG, Suemoto CK, Power MC, Brucki SMD, Nitri R. Incidence of dementia in a Brazilian population: the tremembé epidemiologic study. *Alzheimers Dement*. 2022;18(4):581–590. <https://doi.org/10.1002/alz.12423>.
- 73 Ostrosky-Solis F, Ramirez M, Ardila A. Effects of culture and education on neuropsychological testing: a preliminary study with indigenous and nonindigenous population. *Appl Neuropsychol*. 2004;11(4):186–193. [https://doi.org/10.1207/s15324826an1104\\_3](https://doi.org/10.1207/s15324826an1104_3).
- 74 Brucki SMD, Nitri R. Mini-Mental State Examination among lower educational levels and illiterates: transcultural evaluation. *Dement Neuropsychol*. 2010;4(2):120–125. <https://doi.org/10.1590/s1980-57642010dn40200008>.
- 75 Yassuda MS, Diniz BSO, Flaks MK, et al. Neuropsychological profile of Brazilian older adults with heterogeneous educational backgrounds. *Arch Clin Neuropsychol*. 2009;24(1):71–79. <https://doi.org/10.1093/arclin/acp009>.
- 76 Parra MA, Baez S, Sedeño L, et al. Dementia in Latin America: paving the way toward a regional action plan. *Alzheimers Dement*. 2021;17(2):295–313. <https://doi.org/10.1002/alz.12202>.
- 77 Ibanez A, Kosik KS. COVID-19 in older people with cognitive impairment in Latin America. *Lancet Neurol*. 2020;19(9):719–721. [https://doi.org/10.1016/s1474-4422\(20\)30270-2](https://doi.org/10.1016/s1474-4422(20)30270-2).
- 78 Ibanez A, Santamaria-Garcia H, Guerrero Barragan A, et al. The impact of SARS-CoV-2 in dementia across Latin America: a call for an urgent regional plan and coordinated response. *Alzheimers Dement (N Y)*. 2020;6(1):e12092. <https://doi.org/10.1002/trc2.12092>.
- 79 Lynch C. World Alzheimer Report 2019: attitudes to dementia, a global survey: public health: engaging people in ADRD research. *Alzheimer's Dementia*. 2020;16:e038255.